ANNUAL REPORT FOR 2003

Sawmill Mitigation Site
Craven County
Project No. 8.1170801
TIP No. B-2531WM

Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
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SUMMARY

The following report summarizes the monitoring activities that have occurred in the 2003-year at the Sawmill Mitigation Site. The 2003-year represents the first year of hydrology and vegetation monitoring following construction. The site must demonstrate hydrologic and vegetation success for a minimum of five years or until the site is deemed successful. The site was constructed to serve as mitigation for impacts associated with the US17 Neuse River Bridge in New Bern.

In May 2003, surface water and groundwater gauges were installed to monitor hydrology on the site. Three separate gauge sets, each with one surface and one groundwater gauge, were positioned on the mitigation site. There are also two reference gauge sets that were installed prior to construction. One reference set is located offsite and the other set is located directly adjacent to the constructed site, within the preservation area.

Hydrologic success criteria are based on the approved mitigation plan and require that the site demonstrate hydrologic frequency, duration, and depth consistent within 10% of the hydrology of the reference areas. Initial results for hydrologic monitoring indicate that the site is meeting the success criteria as stated in the mitigation plan. Three groundwater and surface water gauges were installed in May 2003 after construction. The three groundwater restoration gauges were compared to the two existing reference gauges from May 16th to November 13th. The two reference gauges and two of the restoration gauges (GW-3 & GW-4) recorded saturation for 75.8% of the growing season, while the third restoration gauge (GW-5) recorded saturation at 68.2%. From the data provided, the restoration gauges indicate that saturation levels were similar to those of the reference gauges and met the 10% success criteria. Also, the three surface water gauges show inundation patterns similar to that of the reference gauges.

Vegetation monitoring in the hardwood area yielded 629 trees per acre. This average is above the minimum success criteria of 320 trees per acre. For the marsh grass area, the target species and scale values were 100% and 2.6, respectively. Supplemental planting of swamp blackgum will occur during the 2004-planting year, if plant materials are available from the Forest Service.

Based on the results from the first year of monitoring, NCDOT will continue to monitor hydrology and vegetation on the Sawmill Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The Sawmill Mitigation Site serves (entirely) as mitigation for the US17 Neuse River Bridge in New Bern (Figure 1). Situated adjacent to the new bridge alignment, the 4.07-acre site includes both preservation and restoration of brackish tidal marsh, as well as tidal cypress-gum swamp. Reference areas, both onsite and offsite, are utilized to provide reference data for restoration monitoring.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetation monitoring must be conducted for a minimum of five years or until the site is deemed successful. Vegetation success criteria are based on the National Marine Fisheries Service guidelines. Hydrologic success criteria is based on the approved mitigation plan and require that the site demonstrate hydrologic frequency, duration, and depth consistent within 10% of the hydrology of the reference areas. Included in this report are analyses of hydrologic and vegetation monitoring results, discussions of local climate conditions throughout the growing season, and site photographs.

1.3 Project History

2002	Reference Gauges Installed
April 2003	Site Planted
May 2003	Monitoring Gauges Installed
May-November 2003	Hydrologic Monitoring (Year 1)
July 2003	Hardwood Vegetation Monitoring (1 yr.)
July 2003	Marsh Vegetation Monitoring (1 yr.)

Figure 1. Site Location Map

1.4 Debit Ledger

Table 1. Sawmill Mitigation Site Debit Ledger

SAWMILL				**TIP DEBIT**
SITE HABITAT	Acres per As-built[1]	Acres Per Mitigation Plan Addendum Dated Sept. 2001	Acres Remaining	**B-2531**
Marsh Preservation	0.24	0.35	0.24	
Marsh Enhancement	0.18	0.18	0.18	
Marsh Creation	0.46	0.33	-1.08	1.54[2]
Cypress/Gum Creation	2.1	1.93	0.00	2.1
Cypress/Gum Enhancement	0.28	0.47	0.28	
Upland Buffer	0.81	0.81	0.81	
Total	4.07	4.07	0.43	3.64

1. Per the as-builts, the Marsh Preservation and the Cypress/Gum Enhancement are less than what was shown in the September 2001 Addendum to the Mitigation Plan. This was a result of matching the proposed elevation to the existing elevation so that the wind driven tide could influence the site. If the elevations were not matched, a berm would have been left around the site, thus restricting the tide from receding. This resulted in more Marsh Creation and Cypress/Gum Creation than originally anticipated.

2. NCDOT would like to propose using the Lengyel Mitigation Site to account for the 1.08 acres of Marsh Creation deficit on the Sawmill Mitigation Site. The Lengyel Mitigation Site currently has 5.64 acres of Marsh Restoration available.

2.0 HYDROLOGY

2.1 Success Criteria

The hydrologic success criteria established for the Sawmill Mitigation Site, as stipulated in the approved mitigation plan and subsequent revisions, requires that the site demonstrate hydrologic frequency, duration, and depth consistent within 10% of the hydrology of the reference areas. The site-specific criteria vary from current federal guidelines that require a site to be inundated or saturated (within 12" of the surface) by surface or groundwater for a consecutive 12.5% of the growing season.

The growing season in Craven County begins on March 18 and ends November 14. The dates correspond to a 50% probability that air temperature will drop to 28° after March 18 and before November 14[1]; thus, the growing season is 240 days. Local climate must represent average conditions for the area.

2.2 Hydrologic Description

Wind-driven tides are the primary hydrologic input at/on the Sawmill Site; therefore, three sets of gauges were installed within the site's restoration area in May 2003 (Figure 2). Each set includes one surface gauge and one groundwater monitoring gauge. An additional set of gauges is located in each of the two site reference areas. No rain gauge is located on the site, so rainfall data (supplied by the NC State Climate Office) from an official weather station in New Bern is used to supplement the site data. The surface gauges record surface water levels every three hours, while the groundwater gauges record water levels on a daily basis. Monitoring data for 2003 represents the first year of hydrologic monitoring for the site.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The maximum number of consecutive days that saturation occurred within 12 inches of the ground surface was determined for each groundwater-monitoring gauge. This number was converted into a percentage of the 240-day growing season (March 18 – November 14). Table 2 provides the 2003 hydrologic results; Figure 3 is a graphical representation of these results. Appendix A includes graphs of the data recorded at each groundwater and surface water gauge. Daily rainfall events recorded at the official weather station in New Bern are included on each of the groundwater gauge plots.

[1] Soil Conservation Service, Soil Survey of Craven County, North Carolina, 1989.

Figure 2. Monitoring Gauge Location Map

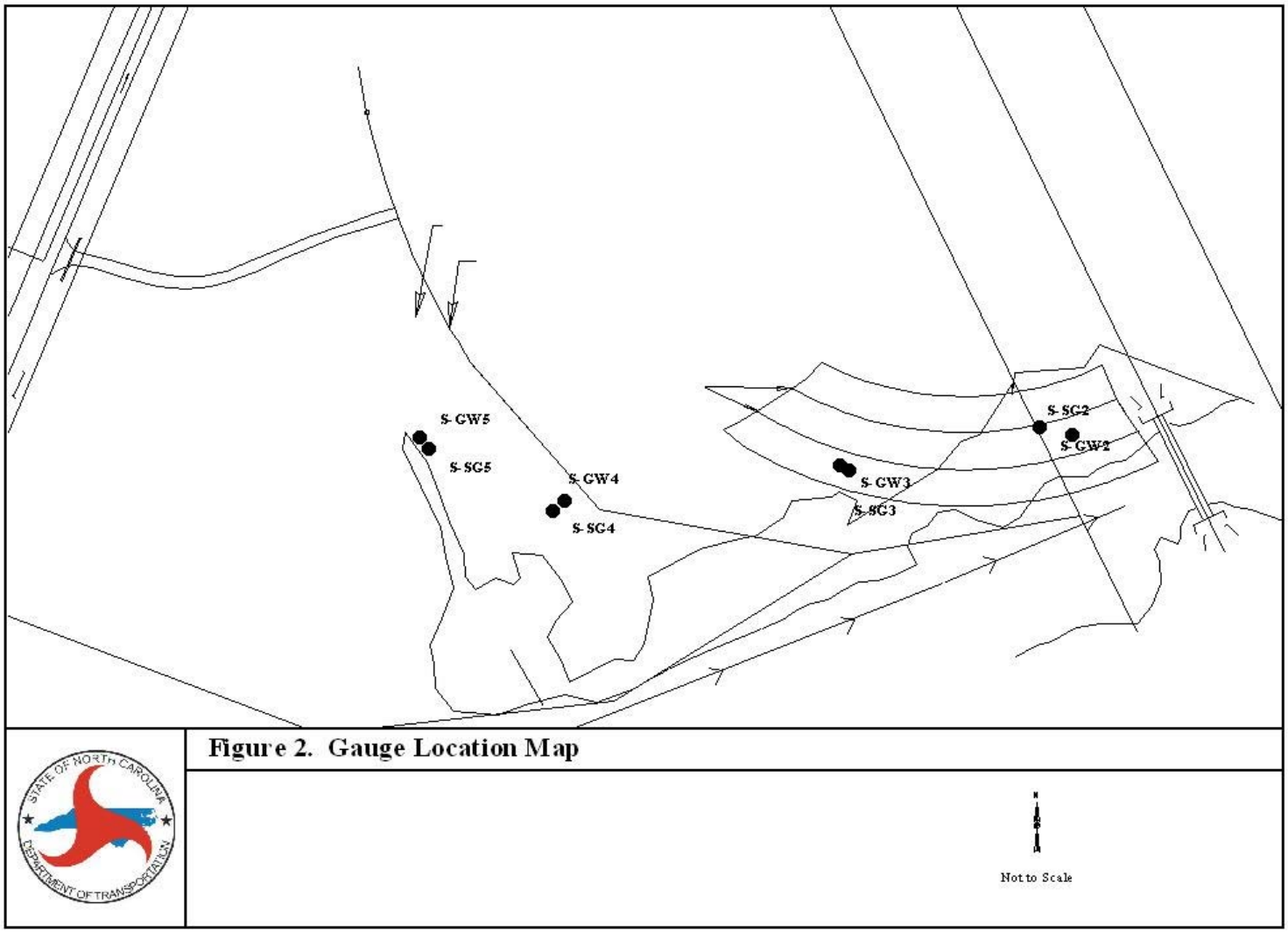


Table 2. 2003 Hydrologic Monitoring Results

Monitoring Gauge	= 10%	Actual %	Success Dates	Actual %	Success Dates
S-GW1 (REF)	✕	100	March 19-Nov 13	75.8	May 16-Nov 13
S-GW2 (REF)	✕	100	March 19-Nov 13	75.8	May 16-Nov 13
S-GW3*	✕	75.8	May 16-Nov 13	75.8	May 16-Nov 13
S-GW4*	✕	75.8	May 16-Nov 13	75.8	May 16-Nov 13
S-GW5*	✕	68.2	June 3-Nov 13	68.2	June 3-Nov 13

Shaded gauges are reference gauges.

*** Gauges were installed May 16, 2003**

2.3.2 Climatic Data

Figure 4 is a comparison of the 2003 monthly rainfall to the historical precipitation (collected between 1972 and 2003) for New Bern, North Carolina. This comparison gives an indication of how 2003 relates to historical data in terms of climate conditions. The NC State Climate Office provided all local rainfall information.

This graph is used to indicate the general precipitation conditions for the surrounding area. The data obtained for the 2003-year indicates above average precipitation for November (02'), February, April, May, June, July, and October. Below average precipitation was reported for January and November. The months of December (02'), March, August, and September experienced average precipitation. Overall, the 2003-year exhibited an average to above average rainfall year.

2.4 Conclusions

The 2003-year represents the first year of hydrologic monitoring for the Sawmill Mitigation Site. Initial results for hydrologic monitoring indicate that the site is meeting the success criteria as stated in the mitigation plan. Three groundwater and surface water gauges were installed in May 2003 after construction. The three groundwater restoration gauges were compared to the two existing reference gauges from May 16th to November 13th. The two reference gauges and two of the restoration gauges (GW-3 & GW-4) recorded saturation for 75.8% of the growing season, while the third restoration gauge (GW-5) recorded saturation at 68.2%. From the data provided, the restoration gauges indicate that saturation levels were similar to those of the reference gauges and met the 10% success criteria. Also, the three surface water gauges show inundation patterns similar to that of the reference gauges. The 2003 data was collected during a year of average to above average rainfall.

NCDOT will continue to monitor hydrology on the Sawmill Mitigation Site.

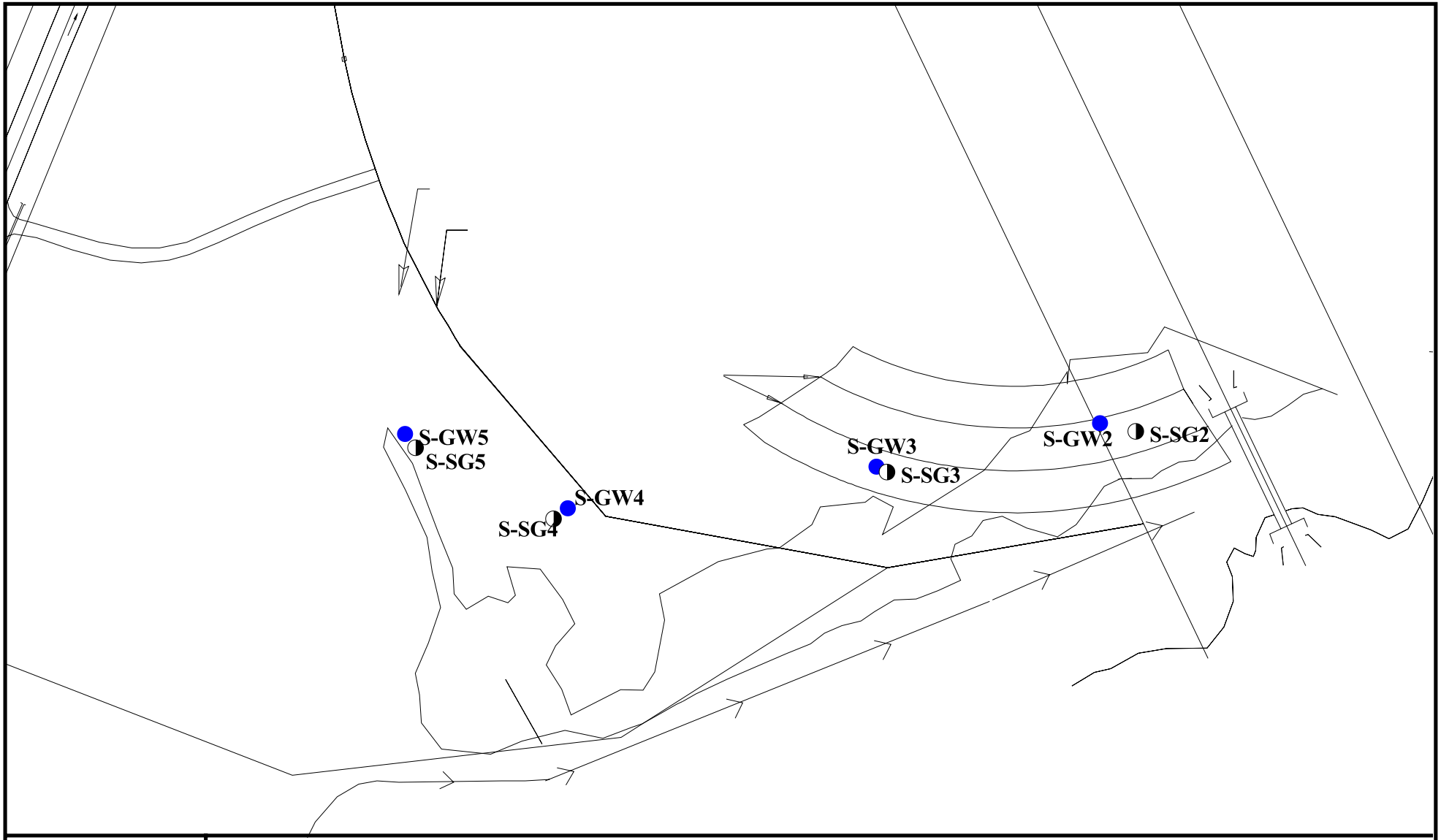


Figure 3. 2003 Hydrologic Monitoring Gauge Results

Hydrology Results

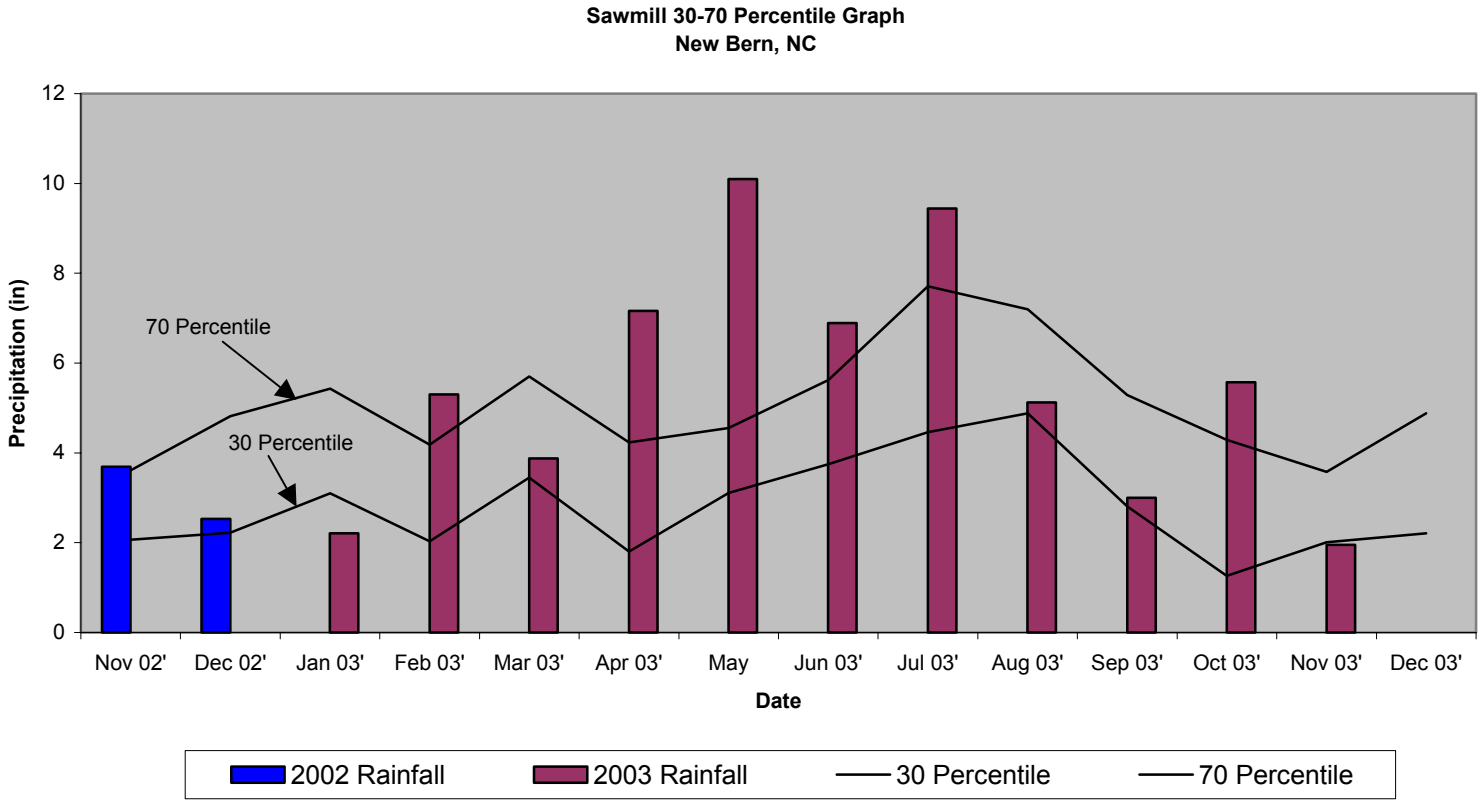
- < 5%
- 5 - 8%
- 8 - 12.5%
- > 12.5%

- Rain Gauge
- Surface Gauge

N

Not to Scale

Figure 4. 30-70 Percentile Graph, New Bern, NC



3.0 VEGETATION: SAWMILL MITIGATION SITE (YEAR 1 MONITORING)

3.1A Success Criteria (Bottomland Hardwood Area)

Success criteria states that at least 320 stems per acre must survive after the completion of the third growing season and 240 stems per acre after the fifth growing season. If desired vegetation has not been established, NCDOT will notify the appropriate agencies and will implement corrective measures.

3.1B Success Criteria (Marsh Grass Area)

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. The vegetation component of the wetland site will be deemed successful if the following criteria are met:

1. At year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.
2. A minimum of 70% of the plots shall contain the target (planted) species.

3.2 Description of Species

The following tree species were planted in the Wetland Restoration Area:

Taxodium distichum, Baldcypress
Fraxinus pennsylvanica, Green Ash
Quercus lyrata, Overcup Oak
Nyssa aquatica, Water Tupelo

The following marsh grass species was planted in the Marsh Grass Area:

Spartina cynosuroides, Big Cordgrass

3.3 Results of Vegetation Monitoring

Table 3: Vegetation Monitoring Statistics

Plot #	Baldcypress	Green Ash	Overcup Oak	Water Tupelo	Total (1 year)	Total (at planting)	Density (Trees/Acre)
1	9	8		18	35	38	626
2	21	11	5	2	39	42	631
Average Density (Trees/Acre)							629

Site Notes:
Six inches of standing water in plot 1.
Other species noted: Cattail, *Scripus* sp., and smartweed.

Plot #	Scale Factor	Big Cordgrass	Frequency	Comments
1	4.0			*Scirpus* sp., Smartweed, Wire Grass
2	3.0			
3	2.0			
4	2.0			2 inches of water
5	3.0			*Scirpus* sp., Wire Grass
6	2.0			
7	2.0			
8	3.0			*Scirpus* sp., Smartweed, Cattail
9	3.0			*Scirpus* sp., Smartweed
10	2.0			2 inches of water
11	2.0			Smartweed
12	3.0			*Scirpus* sp., Smartweed
13	2.0			Cattail
14	3.0			*Scirpus* sp., Smartweed, Cattail
15	4.0			*Scirpus* sp., *Juncus* sp., Cattail
16	2.0			2 inches of water
17	2.0			2 inches of water
18	2.0			Cattail
19	4.0			Ragweed, Smartweed
20	3.0			*Scirpus* sp.
Frequency (Percentage of Plots w/ Desired Species)		100%	100%	
Sum Scale Value			53	
Total Number of Plots			20	
Vegetative Cover (Scale Value)			2.65	

3.4A Conclusions

There were 2 hardwood vegetation-monitoring plots established in the 2.4-acre planting area. The 2003 vegetation monitoring of the site revealed an average tree density of 629 trees per acre. This average is above the minimum success criteria of 320 trees per acre.

3.4B Conclusions

- Percent Frequency of Target Species (planted species) **100%**
  Frequency of 70% required.
- Vegetative Cover Scale Value **2.6**
  Scale value of 5 is required for year 5.

Of the 4.07 acres on this site, approximately 0.78 acres involved marsh grass planting. There were 20 random plots established throughout the planting area. These plots were located with GPS. Based upon the percent frequency and the scale value, the marsh grass area is on track following the first year of monitoring.

Supplemental planting of swamp blackgum will occur during the 2004-planting year, if the species (planting materials) are available from the Forest Service. NCDOT will continue vegetation monitoring at the Sawmill Mitigation Site.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

Initial results for hydrologic monitoring indicate that the site is meeting the success criteria as stated in the mitigation plan. Three groundwater and surface water gauges were installed in May 2003 after construction. The three groundwater restoration gauges were compared to the two existing reference gauges from May 16th to November 13th. The two reference gauges and two of the restoration gauges (GW-3 & GW-4) recorded saturation for 75.8% of the growing season, while the third restoration gauge (GW-5) recorded saturation at 68.2%. From the data provided, the restoration gauges indicate that saturation levels were similar to those of the reference gauges and met the 10% success criteria. Also, the three surface water gauges show inundation patterns similar to that of the reference gauges.

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NCDOT will continue hydrology and vegetation monitoring on the Sawmill Mitigation Site.

APPENDIX A

GAUGE DATA GRAPHS

APPENDIX B

SITE PHOTOS

Sawmill

Photo 1

Photo 2

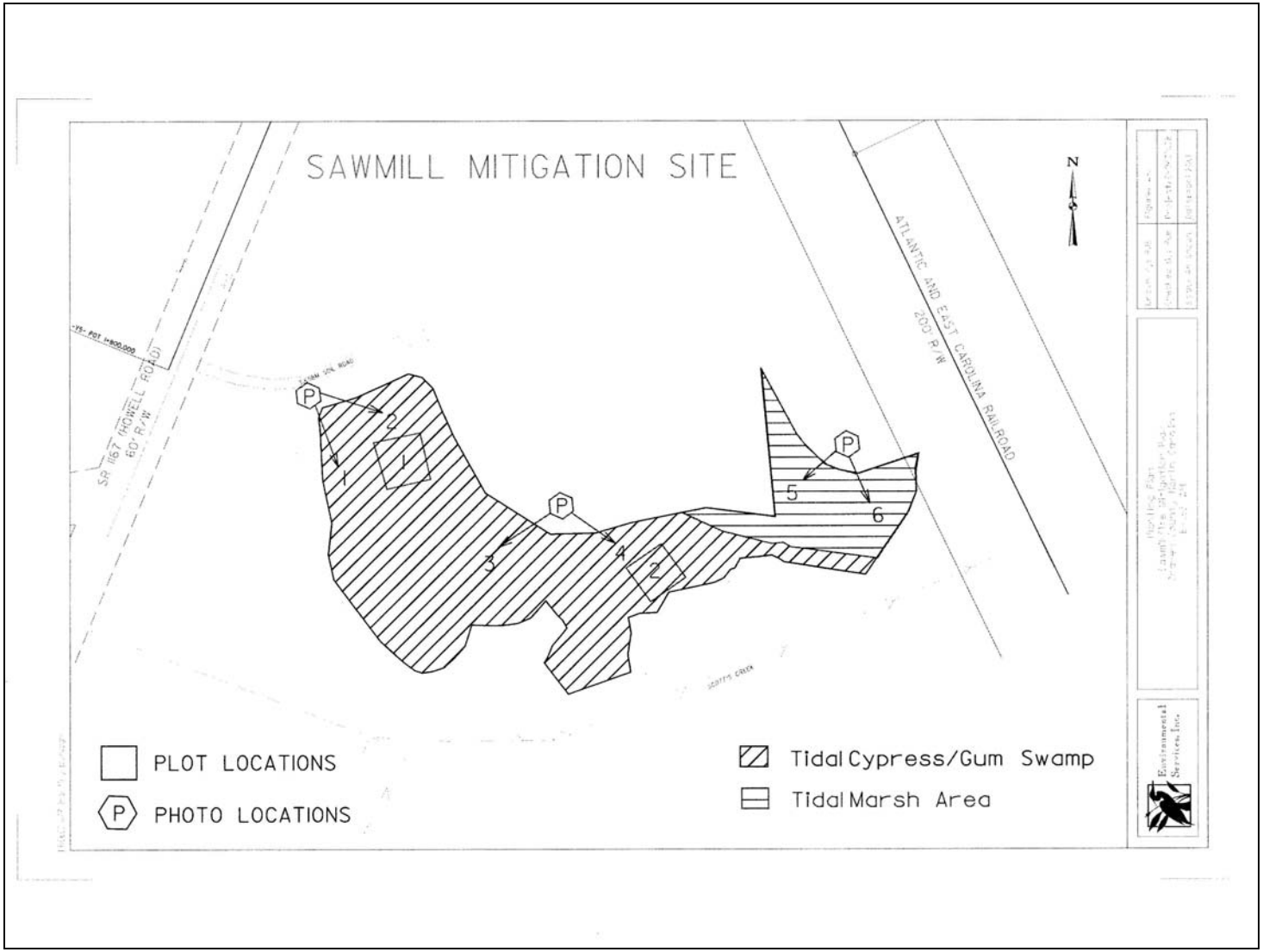
Photo 3

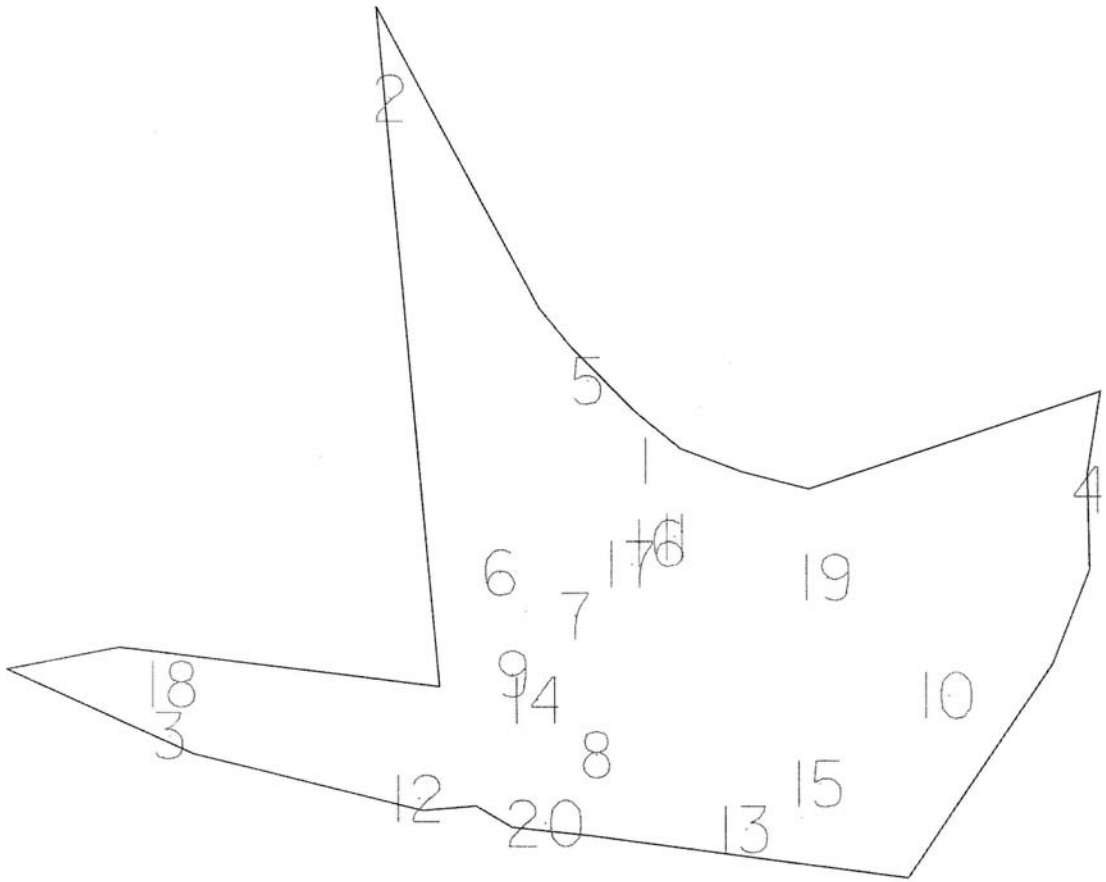
Photo 4

Photo 5

Photo 6

2003


SAWMILL MITIGATION SITE
N
ATLANTIC AND EAST CAROLINA RAILROAD
200' R/W
SR 1167 (HOWELL ROAD)
60' R/W
1
2
3
4
5
6
P
PLOT LOCATIONS
PHOTO LOCATIONS
Tidal Cypress/Gum Swamp
Tidal Marsh Area
Environmental Services, Inc.



SAWMILL MITIGATION SITE
Marsh Grass Random Plot Locations
2003 Monitoring